

CLAIMS

1. A magnetic recording medium providing on a non-magnetic substrate at least a soft magnetic undercoat film, a first undercoat film that controls the orientation of the film directly above, a second undercoat film, and a perpendicular magnetic recording film whose easy magnetization axis is generally oriented perpendicular to the substrate, and a protective film, wherein
said first undercoat film consists of Pt, Pd, or an alloy including at least one among these and the second undercoat film consists of Ru or an Ru alloy.
2. A magnetic recording medium according to claim 1 wherein the thickness of the first undercoat film is equal to or greater than 0.5 nm and equal to or less than 10 nm.
3. A magnetic recording medium according to claim 1 wherein the thickness of the second undercoat film is equal to or greater than 0.5 nm and equal to or less than 10 nm.
4. A magnetic recording medium according to claim 1 wherein the first undercoat film has a fcc structure.
5. A magnetic recording medium according to claim 1 wherein a seed film having an amorphous structure or a microcrystalline structure is provided between the soft magnetic undercoat film and the first undercoat film.
6. A magnetic recording medium according to claim 1 wherein the first undercoat film includes C.
7. A magnetic recording medium according to claim 1 wherein the perpendicular magnetic recording film consists of a material that includes at least Co and Pt, and whose negative nucleation field ($-H_n$) is equal to or greater than 0.

8. A magnetic recording medium according to claim 1 wherein the first undercoat film having a granular structure consists of Pt or Pd, and an oxide.
9. A magnetic recording medium according to claim 8 wherein the oxide is selected from SiO_2 , Al_2O_3 , Cr_2O_3 , CoO , and Ta_2O_5 .
10. A magnetic recording medium according to claim 1 wherein the second undercoat film has a granular structure consisting of Ru or an Ru alloy, and an oxide.
11. A magnetic recording medium according to claim 10 wherein the oxide is selected from SiO_2 , Al_2O_3 , Cr_2O_3 , CoO , and Ta_2O_5 .
12. A magnetic recording medium according to claim 1 wherein the perpendicular magnetic recording film consisting of a material having at least one of SiO_2 , Al_2O_3 , ZrO_2 , Cr_2O_3 , and Ta_2O_5 added to a CoPt alloy or an CoCrPt alloy.
13. A fabricating method for a magnetic recording medium comprising the steps of:
forming in sequence on a non-magnetic substrate at least a soft magnetic undercoat film, a first undercoat film that controls the orientation of the film directly above, a second undercoat film, a perpendicular magnetic recording film whose easy magnetization axis is generally oriented perpendicular to the substrate, and a protective film; and wherein
said first undercoat film consists of Pt, Pd, or an alloy including at least one among these and the second undercoat film consists of Ru or an Ru alloy.
14. A magnetic read/write apparatus providing a magnetic recording medium and a magnetic head that reads and writes data on said magnetic recording medium; wherein
the magnetic head is a single pole head; and

the magnetic recording medium provides on a non-magnetic substrate at least a soft magnetic undercoat film, a first undercoat film that controls the orientation of the film directly above, a second undercoat film, a perpendicular magnetic recording film whose easy magnetization axis is generally oriented perpendicular to the substrate, and a protective film; and said first undercoat film consists of Pt, Pd, or an alloy including at least one among these, and the second undercoat film consists of Ru or an Ru alloy.

15. A magnetic recording medium providing on a non-magnetic substrate at least a soft magnetic undercoat film, an undercoat film that control the orientation and the crystal diameter of the film directly above, a perpendicular magnetic recording film whose easy magnetization axis is generally oriented perpendicular to the substrate, and a protective film; and wherein

said undercoat film consists of an alloy that includes at least Pt and C or an alloy that includes at least Pd and C.

16. A magnetic recording medium according to claim 15 wherein the C content of the undercoat film is equal to or greater than 1 at% and equal to or less than 40 at%.

17. A magnetic recording medium according to claim 15 wherein the C content of the undercoat film is equal to or greater than 5 at% and equal to or less than 30 at%.

18. A magnetic recording medium according to claim 15 wherein the thickness of the undercoat film is equal to or greater than 0.5 nm and equal to or less than 15 nm.

19. A magnetic recording medium according to claim 15 wherein an intermediate film that includes at least one among Ru and Co is provided between the undercoat film and the perpendicular magnetic recording film.

20. A magnetic recording medium according to claim 15 wherein a seed film having an

amorphous structure or a microcrystalline structure is provided between the soft magnetic undercoat film and the undercoat film.

21. A magnetic recording medium according to claim 15 wherein the undercoat film consists of one among a Pt-C alloy, Pt-Fe-C alloy, Pt-Ni-C alloy, Pt-Co-C alloy, Pt-Cr-C alloy, Pd-C alloy, Pd-Fe-C alloy, Pd-Ni-C alloy, Pd-Co-C alloy, or Pd-Cr-C alloy.
22. A magnetic recording medium according to claim 15 wherein the average diameter of the crystal particles of the undercoat film is equal to or greater than 5 nm or equal to or greater than 12 nm.
23. A magnetic recording medium according to claim 15 wherein the perpendicular magnetic recording film consists of a material that includes at least Co and Pt, and whose negative nucleation field ($-H_n$) is equal to or greater than 0.
24. A magnetic recording medium according to claim 15 wherein the perpendicular magnetic recording film consists of a material having at least one of SiO_2 , Al_2O_3 , ZrO_2 , Cr_2O_3 , and Ta_2O_5 added to a CoPt alloy or a CoCrPt alloy.
25. A fabricating method for a magnetic recording medium comprising the steps of:
forming in sequence on a non-magnetic substrate at least a soft magnetic undercoat film, an undercoat film that controls the orientation and the crystal diameter of the film directly above, a perpendicular magnetic recording film whose easy magnetization axis is generally oriented perpendicular to the substrate, and a protective film; and
said undercoat film consists of an alloy that includes at least Pt and C or an alloy that includes at least Pd and C.
26. A fabricating method for a magnetic recording medium according to claim 25 wherein the undercoat film is formed at a temperature of 150 to 400°C.

27. A magnetic read/write apparatus providing a magnetic recording medium and a magnetic head that reads and writes data on said magnetic recording medium; wherein

the magnetic head is a single pole head; and

the magnetic recording medium provides on a non-magnetic substrate at least a soft magnetic undercoat film, an undercoat film that controls the orientation and the crystal diameter of the film directly above, a perpendicular magnetic recording film whose easy magnetization axis is generally oriented perpendicular to the substrate, and a protective film; and wherein said undercoat film consists of an alloy that includes at least Pt and C or an alloy that includes at least Pd and C.